Listing of Claims

1. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator; and

(b) a catalyst precursor comprising:

(i) a Group-8, -9, or -10 transition metal, M;

(ii) an ancillary ligand comprising:

- a terminal amine comprising two independently selected hydrocarbyl radicals, R^1 and R^2
- a terminal phosphine comprising two independently selected hydrocarbyl radicals, R^3 and R^4 and
- a hydrocarbyl bridge Y, wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals; and

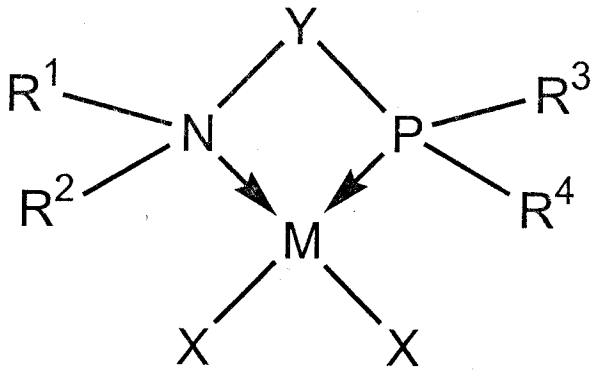
(iii) an abstractable ligand, X, selected from the group consisting of hydride radicals; hydrocarbyl radicals; substituted hydrocarbyl radicals; or hydrocarbyl organometalloid radicals.

wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or $B(C_6F_5)_3$ or $B(C_6H_5)_3$.

2. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator selected from the group consisting of alumoxane, aluminum alkyl, alkyl aluminum halide, alkylaluminum alkoxide, discrete ionic activator, and $B(C_6F_5)_3$ or $B(C_6H_5)_3$; and

(b) a catalyst precursor wherein the catalyst precursor has the following formula:



wherein

(i) M is a Group-8, -9, or -10 transition metal;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently hydrocarbyl radicals;

(v) Y is a hydrocarbyl bridge, wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene,

dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals;

(vi) X are independently hydride radicals; hydrocarbyl radicals; substituted hydrocarbyl radicals; or hydrocarbyl organometalloid radicals.

3. (Original) A catalyst system comprising the reaction product of

(a) the catalyst system of Claim 2 and

(b) ethylene, propylene, 1-butene, or a mixture of any two or all three of ethylene, propylene, and 1-butene.

4. (Original) The catalyst system of Claim 2 further comprising at least one additional olefin polymerization catalyst.

5. (Previously Presented) The catalyst system of Claim 2 wherein R^1, R^2, R^3, and R^4 are independently C1-C40 hydrocarbyls.

6. (Previously Presented) The catalyst system of Claim 5 wherein R^1, R^2, R^3, and R+ are independently C1-C30 hydrocarbyls.

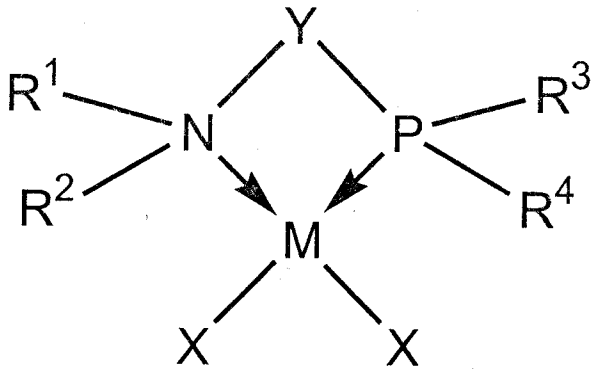
7. (Previously Presented) The catalyst system of Claim 6 wherein R^1, R^2, R^3, and R^4 are independently methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, or cyclododecyl radicals.

8. (Previously Presented) The catalyst system of Claim 7 wherein R^1, R^2, R^3, and R^4 are independently methyl, ethyl, propyl, butyl, cyclohexyl, phenyl, tolyl, benzyl, or phenethyl.

9. (Previously Presented) A catalyst system comprising the reaction product of:

(a) an activator selected from the group consisting of alumoxane, aluminum alkyl, alkyl aluminum halide, alkylaluminum alkoxide, discrete ionic activator, and Lewis acid; and

(b) a catalyst precursor having the following formula:



wherein

(i) M is a Group-8, -9, or -10 transition metal;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently hydrocarbyl radicals;

(v) Y is a hydrocarbyl bridge, comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long;

(vi) X are independently hydride radicals; hydrocarbyl radicals; substituted hydrocarbyl radicals; or hydrocarbyl organometalloid radicals.

10. (Previously Presented) The catalyst system of Claim 9 wherein two X's are connected to each other to form a 3-to-50-atom metallacycle ring.

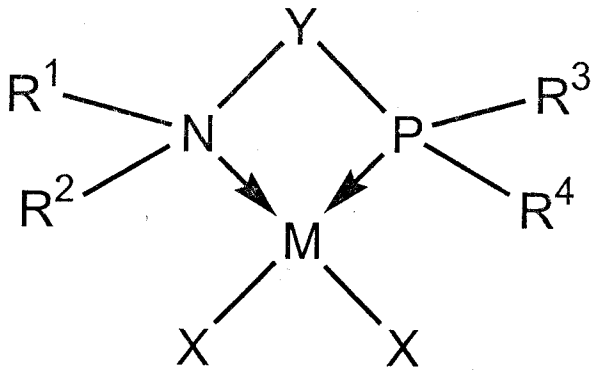
11. (Currently Amended) The catalyst system of Claim 2 wherein X are independently ~~halogen,~~ alkoxide, aryloxide, amide, or phosphide radicals.

12. (Currently Amended) The catalyst system of Claim 11 wherein X are independently ~~chloride, bromide, iodide,~~ methoxide, ethoxide, dimethylamide, diethylethoxide, or phenoxide.

13. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator selected from the group consisting of alumoxane, aluminum alkyl, alkyl aluminum halide, alkylaluminum alkoxide, discrete ionic activator, and $B(C_6F_5)_3$ or $B(C_6H_5)_3$; and

(b) a catalyst precursor having the following formula:



wherein

(i) M is a Group-8, -9, or -10 transition metal;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently hydrocarbyl radicals;

(v) Y is a hydrocarbyl bridge, wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene,

heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals;

(vi) X are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, and ~~tolyl,~~ tolyl.

14. (Cancelled)

15. (Previously Presented) The catalyst system of Claim 2 wherein M is selected from the group consisting of nickel, iron, cobalt, palladium, platinum, ruthenium, osmium, rhodium, and iridium.

16. (Previously Presented) The catalyst system of Claim 15 wherein M is selected from the group consisting of iron, nickel, cobalt, and palladium.

17. (Previously Presented) The catalyst system of Claim 15 wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene,

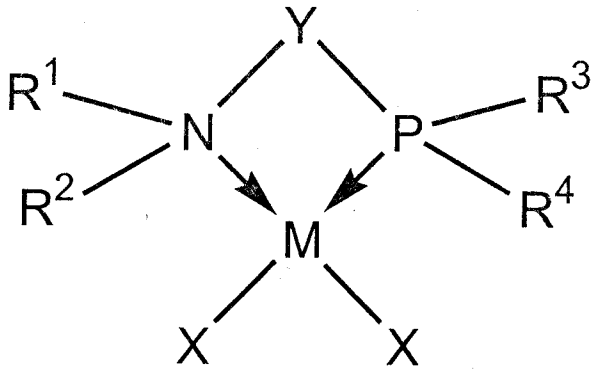
hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals.

18. (Previously Presented) The catalyst system of claim 17 wherein Y is biphenyl.

19. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator selected from the group consisting of alumoxane, aluminum alkyl, alkyl aluminum halide, alkylaluminum alkoxide, discrete ionic activator, and Lewis acid; and

(b) a catalyst precursor wherein the catalyst precursor has the following formula:



wherein

(i) M is a Group-8, -9, or -10 transition metal;

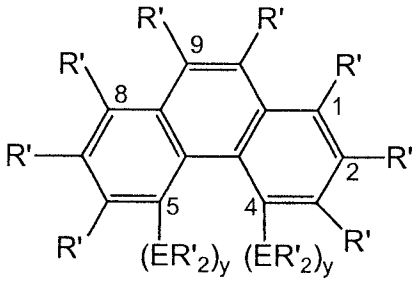
(ii) N is nitrogen;

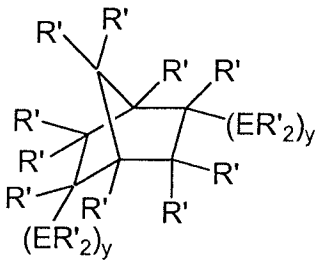
(iii) P is phosphorus;

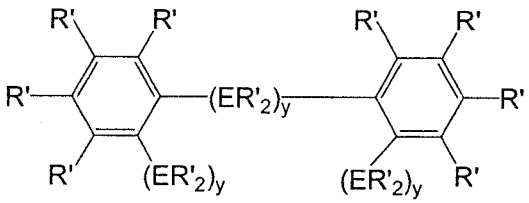
(iv) R^1, R^2, R^3, and R^4 are independently hydrocarbyl radicals;

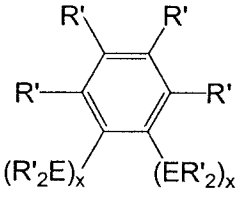
(v) X are independently abstractable ligands; and

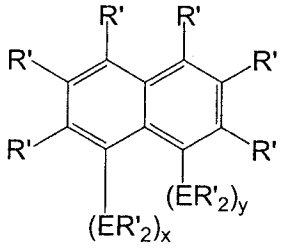
(vi) Y has one of the following formulas:

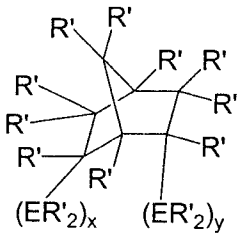


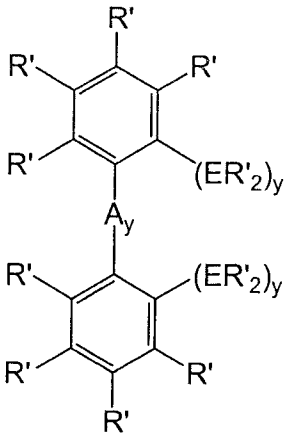


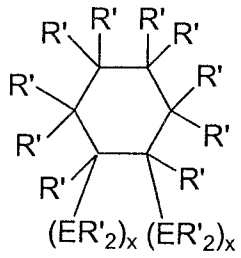


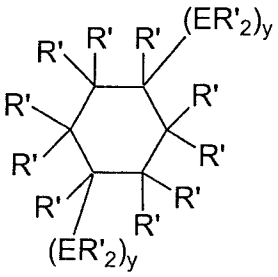


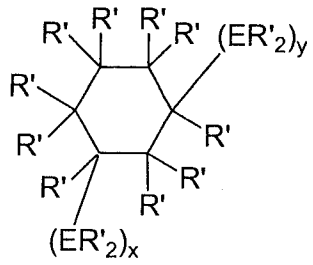


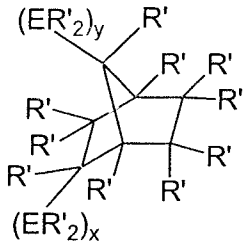


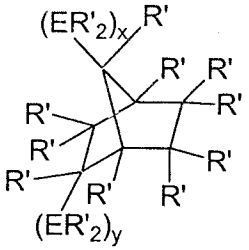

R'
R'
R'
R'
(ER'2)y
Ay
R'
(ER'2)y
R'
R'
R'

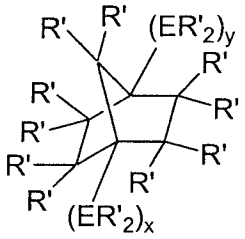

R'
R'
R'
R'
R'
R'
R'
R'
R'
R'
(ER'2)x
(ER'2)x

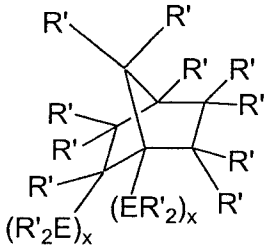

(ER'2)y
R'
R'
R'
R'
R'
R'
R'
R'
R'
R'
(ER'2)y

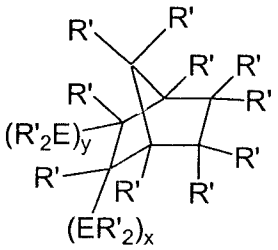

R'
R'
R'
R'
(ER'2)y
R'
R'
R'
R'
R'
R'
(ER'2)x

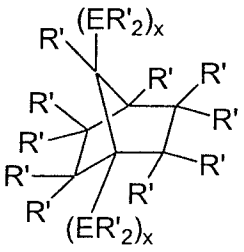


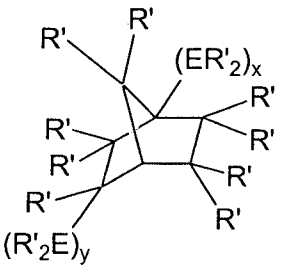


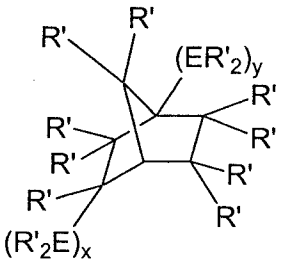












where

(a) R' are independently hydrogen or C1-C50 hydrocarbyl radicals;

(b) A is a non-hydrocarbon atom functional group;

(c) E is a Group-14 element;

(d) x is an integer from 1 to 4; and

(e) y is an integer from 0 to 4.

20. (Previously Presented) The catalyst system of Claim 19 wherein A is selected from the group consisting of C=O, C=S, O, S, SO2, NR*, PR*, BR*, $SiR*_2$, and $GeR*_2$, where R* is independently a hydrocarbyl or halocarbyl radical.

21. (Withdrawn) A polymerization method comprising the step of providing at least one catalyst system of Claim 2.

22. (Withdrawn) The polymerization method of Claim 21 wherein the catalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour.

23. (Withdrawn) The polymerization method of Claim 22 further comprising recovering a product comprising greater than 50 mol% of linear C4-C14 a-olefins based on the total weight of polymerized product.

24. (Withdrawn) The polymerization method of Claim 23 wherein the product comprises greater than 80 mol% of linear C4-C14 alpha-olefins.

25. (Withdrawn) The polymerization method of Claim 24 wherein the product comprises greater than 50 mol% of linear C4 and C6 alpha-olefins.

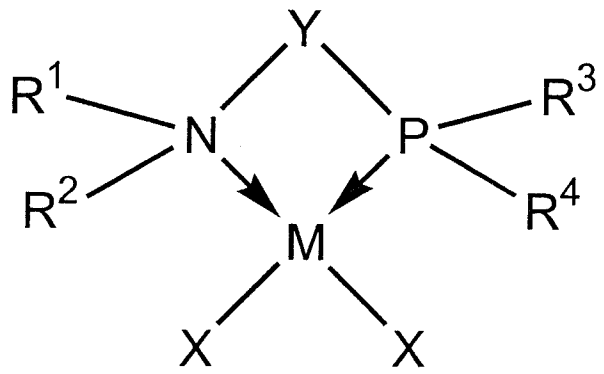
26. (Withdrawn) The polymerization method of Claim 25 wherein the product comprises greater than 80 mol% of linear C4 and C6 alpha-olefins.

27. (Cancelled)

28. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is iron, nickel, cobalt, or palladium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, and cyclododecyl radicals;

(v) Y is a hydrocarbyl bridge wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene,

hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals; and

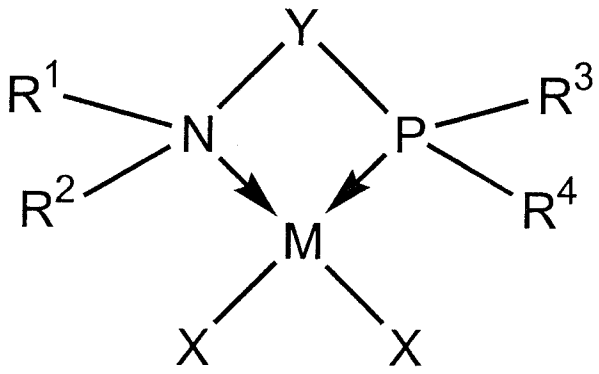
(vi) X are independently hydride radicals; hydrocarbyl radicals; substituted hydrocarbyl radicals; or hydrocarbyl organometalloid radicals,

wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, and $B(C_6F_5)_3$ or $B(C_6H_5)_3$.

29. (Previously Presented) An olefin polymerization or oligomerization catalyst system comprising the reaction product of:

(a) an activator; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is nickel, iron, cobalt, palladium, platinum, ruthenium, osmium, rhodium, or iridium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, and cyclododecyl radicals;

(v) Y is a hydrocarbyl bridge wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decaclienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals; and

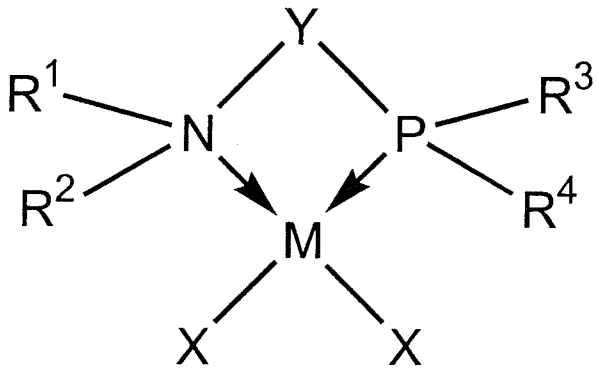
(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring,

wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, and $B(C_6F_5)_3$ or $B(C_6H_5)_3$.

30. (Previously Presented) An olefin polymerization or oligomeriztion catalyst system comprising the reaction product of:

(a) an activator; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is nickel, iron, cobalt, palladium, platinum, ruthenium, osmium,

rhodium, or iridium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, or cyclododecyl radicals;

(v) Y is a butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenylene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decadienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, or dodecatrienylene radical ~~radicals~~; and

(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl,

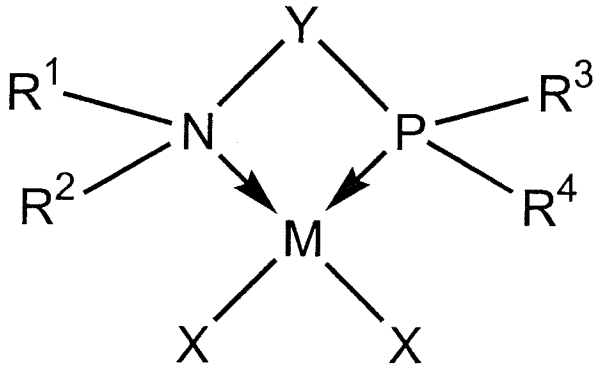
heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to each other to form a 3-to-40-atom metallacycle ring,

wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, and $B(C_6F_5)_3$ or $B(C_6H_5)_3$.

31. (Previously Presented) An olefin polymerization or oligimerization catalyst system comprising the reaction product of:

(a) an activator; and

(b) a catalyst precursor with the following formula:



wherein

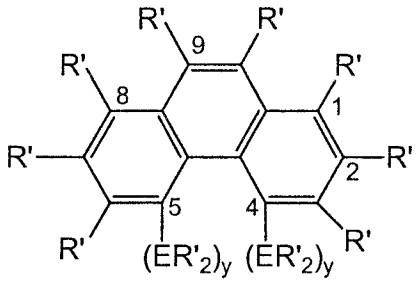
(i) M is a Group-8, -9, or -10 transition metal;

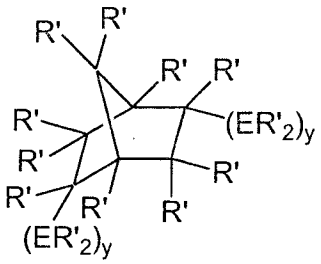
(ii) N is nitrogen;

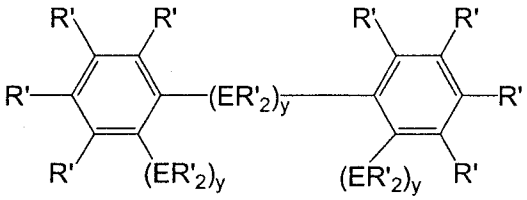
(iii) P is phosphorus;

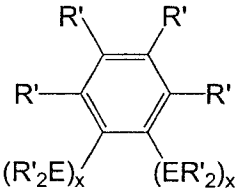
(iv) R^1, R^2, R^3, and R^4 are independently hydrocarbyl radicals;

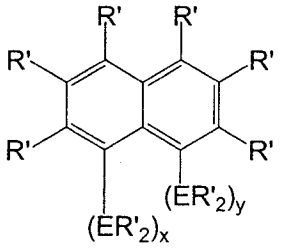
(v) Y is represented by one of the following formulas:

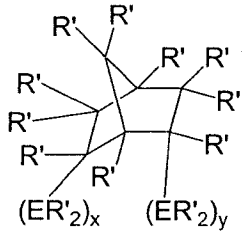

R'
9
8
1
2
5
4
(ER'2)y
(ER'2)y

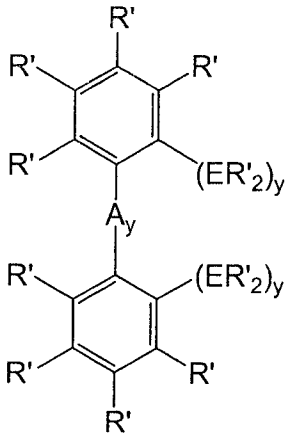

R'
(ER'2)y
(ER'2)y

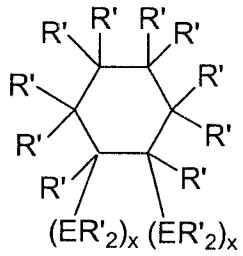

R'
(ER'2)y
(ER'2)y

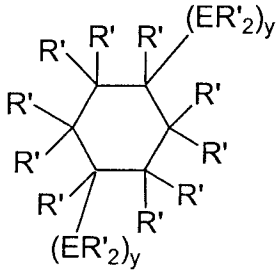

R'
(R'2E)x
(ER'2)x

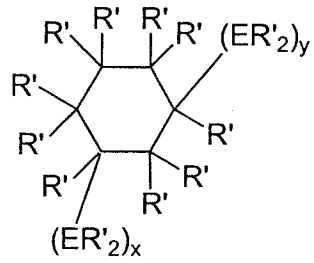

R'
(ER'2)y
(ER'2)x

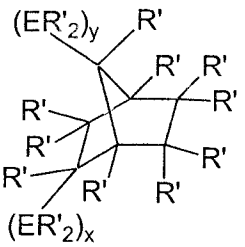

R'
(ER'2)x
(ER'2)y

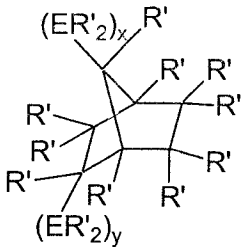


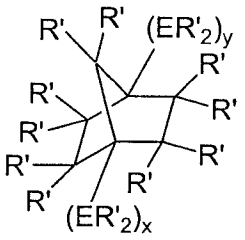


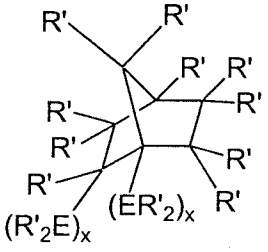


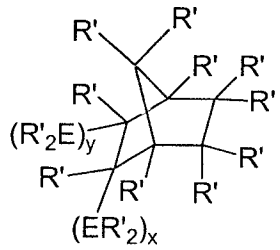


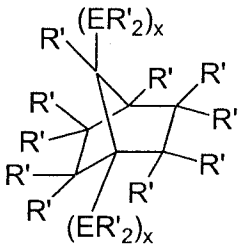


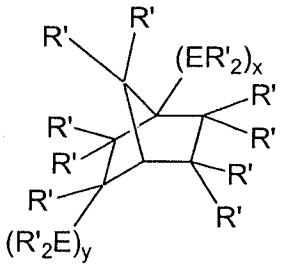


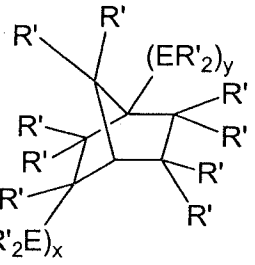












where

- R' are independently, hydrogen or C1-C50 hydrocarbyl radicals;
- A is a non-hydrocarbon atom functional group;
- E is a Group-14 element;

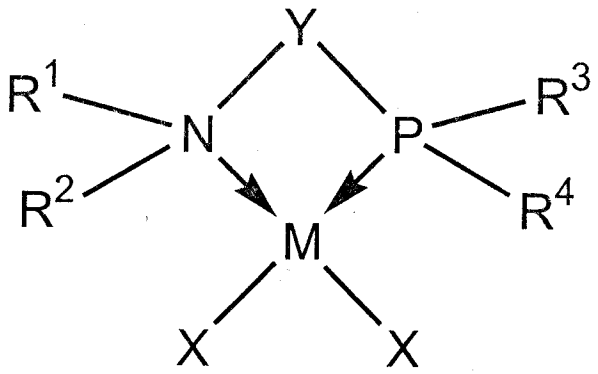
- x is an integer from 1 to 4; and
- y is an integer from 0 to 4,

(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1,1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to each other to form a 3-to-40-atom metallacycle ring,
wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid.

32. (Withdrawn) A polymerization method wherein the catalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:

(a) an activator which is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is iron, nickel, cobalt, and palladium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and ^{R4} are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;

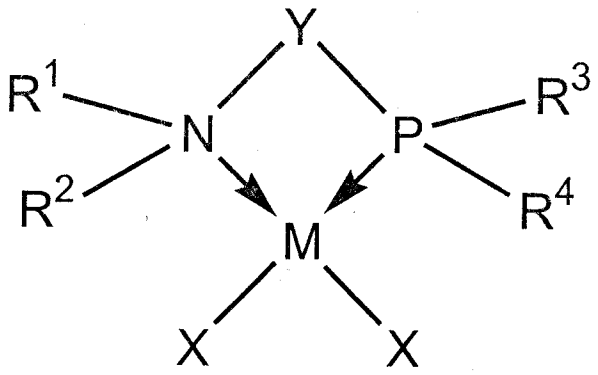
(v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long;

(vi) X are independently abstractable ligands.

33. (Withdrawn) A polymerization method wherein the catalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:

(a) an activator which is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is iron, nickel, cobalt, and palladium, platinum, ruthenium, osmium, rhodium, and iridium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;

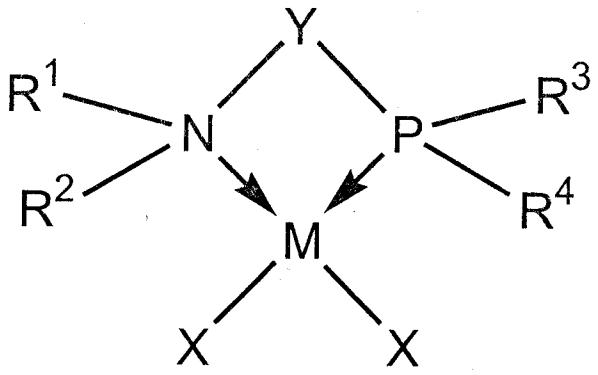
(v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long; and

(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.

34. (Withdrawn) A polymerization method wherein the catalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:

(a) an activator which is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid; and

(b) a catalyst precursor with the following formula:



wherein

(i) M is iron, nickel, cobalt, and palladium, platinum, ruthenium, osmium, rhodium, and iridium;

(ii) N is nitrogen;

(iii) P is phosphorus;

(iv) R^1, R^2, R^3, and R^4 are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;

(v) Y is selected from butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenylene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decadienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals; and

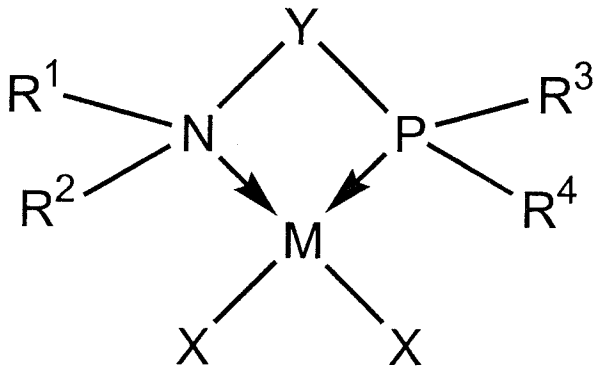
(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl,

phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.

35. (Withdrawn) A polymerization method wherein thecatalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:

(a) an activator which is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid; and

(b) a catalyst precursor with the following formula:



wherein

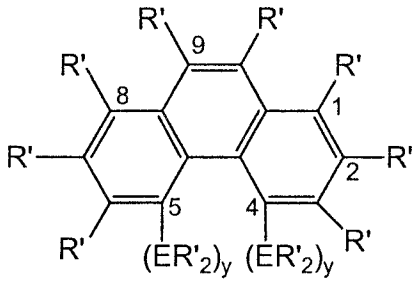
(i) M is a Group-8, -9, or -10 transition metal;

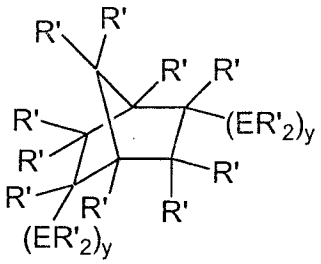
(ii) N is nitrogen;

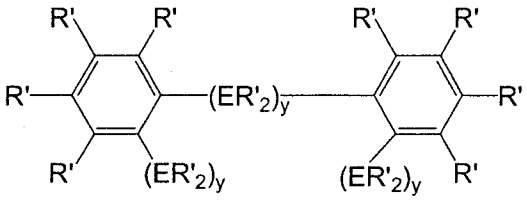
(iii) P is phosphorus;

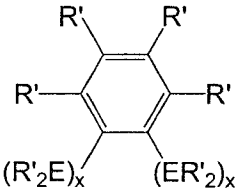
(iv) R^1, R^2, R^3, and R^4 R', R2, R3, and R4 are independently hydrocarbyl radicals;

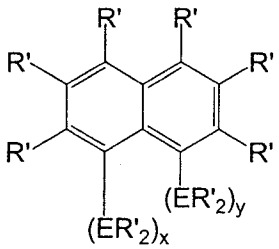
(v) Y is represented by one of the following formulas:

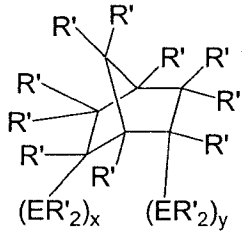

R'
9
8
1
2
5
4
(ER'2)y

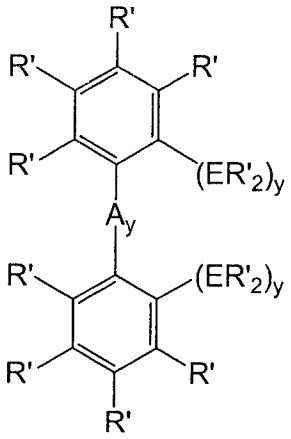

R'
(ER'2)y

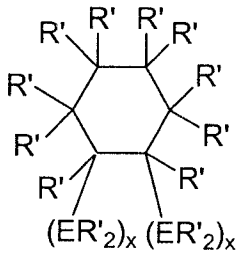

R'
(ER'2)y

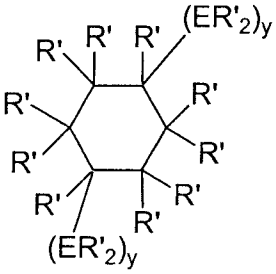

R'
(R'2E)x
(ER'2)x

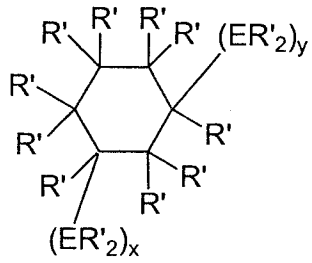

R'
(ER'2)y
(ER'2)x

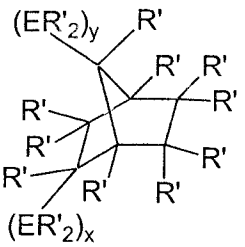

R'
(ER'2)x
(ER'2)y

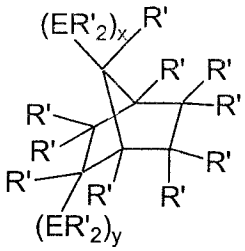


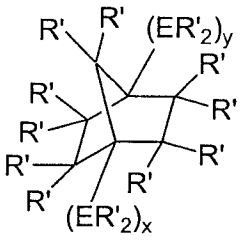


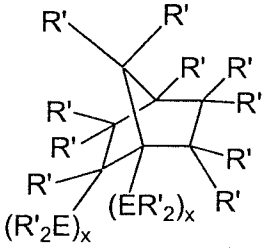


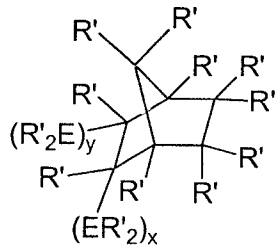


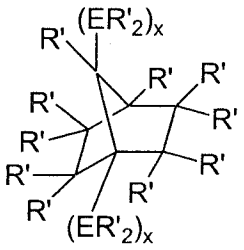


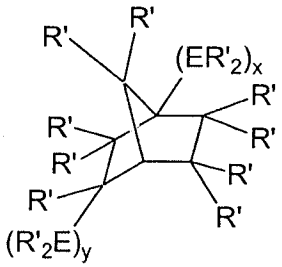


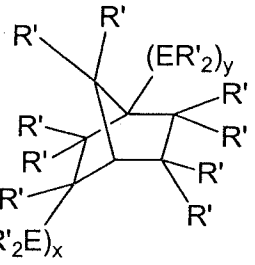












where

- R' are independently, hydrogen or C1-C50 hydrocarbyl radicals;
- A is a non-hydrocarbon atom functional group;
- E is a Group-14 element;

- x is an integer from 1 to 4; and
- y is an integer from 0 to 4. 0 to 4,

(vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1,1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.

36. (Previously Presented) The catalyst system of Claim 1, wherein the activator comprises a cyclic oligomeric aluminum compound represented by the formula (R"-Al-O)n, or a linear oligomeric aluminum compound represented by the formula R"(R"-Al-O)nAlR"$_2$, wherein R" is independently a C1-C20 alkyl radical, and wherein n is an integer from 1-50.

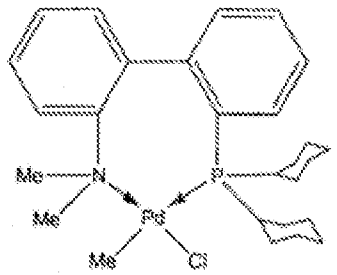
37. (Previously Presented) The catalyst system of Claim 1, wherein the activator is methylalumoxane.

38. (Previously Presented) The catalyst system of Claim 1, wherein the activator is triethylaluminum, diethylaluminum chloride, triisobutylaluminum, tri-n-octylaluminum, or a combination thereof.

39. (Previously Presented) The catalyst system of Claim 1, wherein the activator is $[Me_2PhNH][B(C_6F_5)_4]$, $[Bu_3NH][BF_4]$, $[NH_4][PF_6]$, $[NH_4][SbF_6]$, $[NH_4][AsF_6]$, $[NH_4][B(C_6H_5)_4]$, $B(C_6F_5)_3$, $B(C_6H_5)_3$, or a combination thereof.

40. (Previously Presented) The catalyst system of Claim 1, wherein the catalyst is deposited on a solid support, the solid support comprising polymeric materials or refractory oxide materials.

41. (Withdrawn) The catalyst system of claim 1 wherein the catalyst precursor has the formula:



Formula XXIII

42. (Withdrawn) The catalyst system of Claim 2 wherein X are independently selected from the group consisting of methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, and methylethylamino.